Appendix G

Conceptual Water Quality Management Plan

CONCEPTUAL WATER QUALITY MANAGEMENT PLAN

Tentative Tract Map No. 17707

Permit No. GPA 12-13-3705; ZC 12-13-3706

Project Address:
28201 Rancho Parkway
Lake Forest, CA

Prepared for:
Baker Ranch Properties, LLC
1 Upper Newport Plaza
Newport Beach, CA 92660

Prepared by:

Hunsaker & Associates Irvine, Inc.
3 Hughes
Irvine, CA 92618
ATTN:
Ed Mandich
(949) 583-1010

WQMP Preparation Date:
February 26, 2014

Conceptual Water Quality Management Plan (CWQMP)

TENTATIVE TRACT MAP NO. 17707

PERMIT NO. GPA 12-13-3705, ZC 12-13-3706

APN 104-143-46 & 104-143-47

28201 Rancho Parkway

Lake Forest, CA

Prepared for:

Baker Ranch Properties, LLC.

1 Upper Newport Plaza

Newport Beach, CA 92660

(949) 251-2045

Prepared by:

Hunsaker & Associates, Irvine, Inc.

3 Hughes

Irvine, CA 92618

(949) 583-1010

Contact: Ed Mandich

Prepared on:

February 26, 2014

Project Owner's Certification			
Permit/Application No.	GPA 12-13-3705 ZC 12-13-3706	Grading Permit No.	Project is in Entitlement Phase – Grading Permit No. to be provided with Final WQMP
Tract/Parcel Map No.	TTM 17707	Building Permit No.	Project is in Entitlement Phase – Building Permit No. to be provided with Final WQMP
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN 104-143-46 & -47

This Water Quality Management Plan (WQMP) has been prepared for Baker Ranch Properties by Hunsaker and Associates Irvine, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region and San Diego Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Larry Tucker			
Title	Co-Managing Member		
Company	Baker Ranch Properties		
Address	1 Upper Newport Plaza, Newport Beach, CA 92660		
Email			
Telephone #	(949) 251-2045		
Signature		Date	

Preparer (Engineer): Ed Mandich			
Title	Project Manager	PE Registration #	
Company	Hunsaker and Associates Irvine, Inc.		
Address	3 Hughes, Irvine, CA 92618		
Email	emandich@hunsaker.com		
Telephone #	(949) 583-1010		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board**.**			
Preparer Signature		Date	
Place Stamp Here			

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Attachments

Section I Discretionary Permit(s) and Water Quality Conditions

The project's discretionary permit and water quality information are provided in the following:

Project Infomation			
Permit/Application No.	GPA 12-13-3705 ZC 12-13-3706	Tract/Parcel Map No.	TTM No. 17707
Water Quality Conditions			
Water Quality Conditions (list verbatim)	The project is considered a priority project under Order No. R9-2009-0002, the City of Lake Forest Local Implementation Plan and Water Quality Ordinance (LFMC Chapter 15.14). Therefore, the project is subject to the requirements of a Water Quality Management Plan (WQMP) to minimize the adverse effects of urbanization on site hydrology, runoff flow rates and pollutant loads. Specific water quality conditions from the Conditions of Approval will be included in this WQMP once they have been provided.		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	The eastern portion (majority) of the project site is located within the Aliso Creek Watershed and subject to the requirements of the South Orange County Hydromodification Management Plan and MS4 Permit. The western portion of the project site is located within the San Diego Creek Watershed (Serrano Creek) and subject to the requirements of North Orange County MS4 Permit. Currently, a WIHMP has not been approved for San Diego Creek. The project's southern receiving waters (Aliso Creek, Aliso Creek Mouth, Aliso Creek Mouth at Pacific Ocean).are listed as impaired on the 303(d) List for Indicator Bacteria. Per the SWRCB and EPA, TMDLs are currently "needed" but not yet established. The project's northern receiving waters discharges to San Diego Creek via Serrano Creek. Impairments for the project's receiving waters are as follows: Serrano Creek is currently 303(d) listed for Ammonia, Indicator Bacteria and pH. No TMDL's have been established. San Diego Creek Reach 2 is currently 303(d) listed for Indicator Bacteria, Nutrients, Sedimentation/Siltation and Unknown Toxicity. And has TMDLs for Metals, Nutrients, Sedimentation/Siltation and Unknown Toxicity. San Diego Creek Reach 1 is currently 303(d) listed for Pathogens, Nutrients, Pesticides, Sediment and Metals and has established TMDL's for Metals, Nutrients, Pesticides and Siltation.		

	Newport Bay (Upper and Lower) is currently 303(d) listed for Pesticides, Metals, Pathogens, Nutrients, Organics and Toxicity, with established TMDL's for Metals, Nutrients, Pathogens, Pesticides and Siltation.

Section II Project Description

II.1 Project Description

Description of Proposed Project		
Development Category (Verbatim from WQMP):	Priority Project, Category 1 – New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees.	
Project Area (ft^2): 1,308,335 ft^2, 30.035 ± acres (gross)	Number of Dwelling Units: 115 single family residential units and 1 mass graded lot for future medium density residential.	SIC Code: N/A. Project proposes residential units.
Narrative Project Description:	The proposed project, Tentative Tract Map No. 17707, encompasses approximately 30.0 acres within the City of Lake Forest. The site is bounded to the north by State Route 241, to the east by Portola Parkway, to the south by Rancho Parkway and to the west by an existing commercial business park. Proposed entrance into the site will be consistent with the existing entrance, via a single entrance off Rancho Parkway. Current address for the site is 28201 Rancho Parkway. The western portion of the proposed project site will include 115 detached single-family residences (low/medium density) with lot sizes ranging from 3525 square feet to 6303 square feet, private streets, parkway landscaping, recreation area, curb, sidewalk and gutter and storm drain improvements and related infrastructure improvements. The eastern portion of the site will consist of the project's proposed biofiltration BMP (Lot P), open space lot (Lot K) and a mass graded pad (Lot 117) for future medium density residential improvements by others (merchant builder). Parking will be provided via garage and un-covered surface parking. All dwelling units will have a two-car garage, with uncovered parking spaces provided in private driveways and project streets. Total parking shall be consistent with City of Lake Forest requirements. Designated open space/landscaping provided by the developer will consist of common areas located are throughout the project, which include open space lots, a recreation site, a basin site and parkway landscaping. In the ultimate condition, landscaping is anticipated to consists of approximately 37% of the project site (estimate includes private landscaping for LDR and MDR lot specific improvements).	

Description of Proposed Project

Site summary is as follows:

Lot	Use	Area (Ac)
1 – 61	Single Family Residential 47' x 75' Lots	5.5
62-112	Single-Family Residential 55' x 65' Lots	4.7
113	Entry Gate	0.1
114	Future Multi-Family (MDR)	9.7
115	Recreation Site	0.5
A – K	Open Space	2.0
L – O	Utility & Emergency Vehicle Access	0.2
P	Basin	1.8
Q, R & S	Private Streets	5.5
Total	--	30.0

Typical household wastes are anticipated to be generated daily from the residential portion of the project. Each residential unit will have trash bins located/stored within the private residence of each home. Trash will be collected on a weekly basis by the contracted local waste disposal company.

Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	29.3	97.7	0.7	2.3
Post-Project Conditions	11.1	37	18.9	63

Drainage Patterns/Connections

In the natural condition, drainage from western portion of the site was conveyed westerly to Serrano Creek. Drainage from the remaining portion of the site was conveyed easterly to Aliso Creek. Due to the site's use for mining operations, drainage in the pre-development condition has been altered, with the entire site flowing southerly and southeasterly toward Rancho Parkway and conveyed via existing swales easterly toward Portola Parkway and then northerly to an existing basin.

Overflow from the basin is discharged to existing storm drain improvements located in Portola Parkway prior to discharging to Aliso Creek approximately 0.5 miles south of the project site.

II.2 Potential Stormwater Pollutants

Table 2.1, Anticipated and Potential Pollutants Generated by Land Use Type from the Technical Guidance Document (May 2011) lists the following Pollutants of Concern (POC's) associated with Residential Development (attached and detached): Suspended Solid/Sediments, Nutrients, Pathogens (Bacteria/Virus), Pesticides, Oil & Grease and Trash & Debris.

Pollutants of Concern			
Pollutant	E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E		Pollutant is a Primary POC. Potential sources of sediment include existing landscaping areas and disturbed earth surfaces.
Nutrients	E		Pollutant is Primary POC as downstream water is impaired for Nutrients. Potential sources of nutrients include fertilizers, sediment and trash/debris.
Heavy Metals		N	
Pathogens (Bacteria/Virus)	E		Pollutant is Primary POC. Potential sources of pathogens include pets, food wastes and landscaping/sediment areas.
Pesticides	E		Pollutant is a Primary POC. Potential sources of pesticides include landscaping and open space areas.
Oil and Grease	E		Potential source of oil and grease is parked vehicles.
Toxic Organic Compounds		N	
Trash and Debris	E		Potential sources include common litter and trash cans from residential homes.

II.3 Hydrologic Conditions of Concern

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

Per the South Orange County Hydromodification Management Plan (SOCHMP), HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts. Additionally, post-project runoff discharge rates and durations for projects shall not exceed pre-development, naturally occurring, runoff flow rates and durations by more than 10% of the time, from 10% of the 2-year runoff event up to the 10-year runoff event.

Per the North Orange County WQMP TGD, HCOCs are considered to exist if the volume for the 2-year runoff event for post-development condition exceeds pre-development condition by more than 5% or the time of concentration is less than the pre-development condition by greater than 5%.

Is the proposed project potentially susceptible to hydromodification impacts?

☒ Yes ☐ No

The proposed project will increase the amount of impervious area located within the project site, thereby increasing runoff volume and rate. Therefore, the project is subject to the hydromodification requirements set forth in the SOCHMP as well as the hydromodification requirements prescribed in the TGD for North Orange County.

Based on the approved WQMP prepared for Rancho Parkway improvements[1] to the south of the project site, which provided hydromodification analysis for both Rancho Parkway extension and TTM 17707, the hydromodification volume that needs to be mitigated is 223,620 ft^3. The proposed basin located at the northeast portion of the project site has been designed to accommodate this volume.

The existing storm drain line located in Rancho Parkway (southwest of the project site) was designed according to the natural tributary area, which includes approximately 4-acres of the western portion of the project site. Based on the information provided from the storm drain plan and study for Rancho Parkway improvements, the 2-year runoff for the pre-development condition is 9.0 cfs (for approximately 4 acres onsite). The 2-year runoff for the project condition has been determined to be approximately 4.3 cfs (for approximately 2.91 acres).

[1] Psomas. December 8, 2011. *WQMP for Rancho Parkway from Hermana Circle to Portola Parkway. City of Lake Forest, CA.*

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics.

In the developed condition, runoff from the small western portion of the site (approximately 2.91 acres) will be drain as sheet flow from project lots to street gutters and conveyed southerly to a proposed catch basin prior to discharging to the existing Rancho Parkway storm drain system. Runoff is then conveyed westerly to Serrano Creek and southerly to Reach 2 of San Diego Creek.

Runoff from the eastern portion of the developed site will be conveyed as sheet flow from project lots to street gutters prior to discharging to project catch basins and the storm drain system. Runoff is then conveyed to a bioretention (biofiltration)/detention basin located at the northeastern portion of the site. Runoff entering the basin is eventually discharged to the existing storm drain system located in Portola Parkway and conveyed approximately 0.5 miles south to Aliso Creek.

The proposed bioretention basin and proprietary biotreatment facilities are intended to satisfy the project's requirements for Low Impact Development (LID) and storm water treatment. Water quality flows (non-storm water flows and the Design Capture Volume) from the project's onsite drainage areas will be conveyed to either of the BMPs for treatment. Additionally, where feasible, depressed landscaping areas (approximately 1-2" in depth) in the project's parkways will be used to retain a small portion of the DCV. It is anticipated that the main mechanisms for removal of the small amount of collected runoff will be soil storage, infiltration and evapotranspiration.

II.5 Property Ownership/Management

The property owner, Baker Ranch Properties, shall assume all BMP maintenance and inspection responsibilities until the establishment of a Homeowners Association. Inspection and maintenance activities are in Section V of this CWQMP.

Section III Site Description

III.1 Physical Setting

General descriptions of the project area are provided below:

Planning Area/ Community Name	Planning Area – Baker Ranch Planned Community Community Name – Tentative Tract Map No. 17707
Location/Address	Northwest of Portola Parkway and Rancho Parkway 28201 Rancho Parkway, Lake Forest, California
Project Area Description	The site is bound to the north by SR-241, to the east by Portola Parkway, to the south by Rancho Parkway and to the west by an existing commercial development. The project site was historically used for sand mining operations. In general, the site slopes in a southeasterly direction toward a constructed berm that parallels Rancho Parkway to the south and Portola Parkway to the east. Currently, the site is used to support a nursery as well as a materials storage yard for various operations.
Land Use	Existing: Commercial with Mineral Resources and Public Facilities Overlay Proposed: Multi-Family Residential
Zoning	Existing: UA/SG/C – Urban Activity/Sand & Gravel/Commercial Proposed: LDR/MDR – Low Density Residential/Medium Density Residential
Acreage	30.0 Acres
Predominant Soil Type	Predominant soil type onsite is Hydrologic Soil Type D.

III.2 Site Characteristics

The following table summarizes general characteristics of the project site:

Precipitation Zone	0.95 in.
Topography	The pre-development site is relatively flat and drains in a southeasterly direction.
Drainage Patterns/Connections	In general, runoff from the site is conveyed southeasterly as sheet flow to an existing swale located at the southern portion of the site. Runoff is then conveyed towards Portola Parkway and northerly to a basin located at the northeastern portion of the property.
Soil Type, Geology, and Infiltration Properties	Based on information from the Natural Resource Conservation Service Web Soil Survey, onsite soils consist primarily of Cieneba Sandy Loam, which is rated as a Hydrologic Group D Soil, characterized as having very slow infiltration rates when thoroughly wet; followed by Myford Loam, also a Group D soil, in the northeastern portion of the site. Geologically, the site is located within the foothills of the Santa Ana Mountains, part of the Peninsular Ranges Geomorphic Province. The region consists of dissected foothills bordering the Los Angeles Basin to the northwest and the granite-core Santa Ana Mountains to the east. The Southern California Batholith forms the core of the Santa Ana Mountains, which is overlain by a thick sequence of sedimentary units, which comprise the foothills. The foothills have been tilted, folded, and faulted since deposition as a result of regional uplift. Drainage from the nearby mountains has dissected the subject area and the alluvial deposits within the subject region are ultimately connected to alluvium of the Tustin Plain to the southwest of the site. Late Miocene to Early Pliocene bedrock materials of the Capistrano Formation that underlie the subject site are primarily composed of sandstone and silty sandstone.
Hydrogeologic (Groundwater) Conditions	No groundwater was encountered in geotechnical borings conducted at the northern portion of the site to 21 feet below existing grade. However, soil borings conducted as part of the Rancho Parkway Extension project to the south encountered groundwater at 24 feet below existing grade. Therefore, groundwater is anticipated at approximately 24 feet below existing grade.
Geotechnical Conditions (relevant to infiltration)	Based on the TGD and NRCS data, underlying soils consists primarily of Group “D” soils, which are not favorable for infiltration.
Off-Site Drainage	The project does not receive offsite run-on from adjacent properties.
Utility and Infrastructure Information	Wet and dry utilities are proposed for this tract and will connect to existing facilities located along Rancho Parkway.

III.3 Watershed Description

The following table includes descriptions of the project's receiving waters:

Receiving Waters	Santa Ana RWQCB: Serrano Creek, San Diego Creek (Reach 2), San Diego Creek (Reach 1), Upper and Lower Newport Bay. San Diego RWQCB: Aliso Creek, Aliso Creek (Mouth), Pacific Ocean at Aliso Creek (Mouth)
303(d) Listed Impairments	*Santa Ana RWQCB:* Serrano Creek – Ammonia, Indicator Bacteria, pH San Diego Creek (Reach 2) – Indicator Bacteria, Nutrients, Sedimentation/Siltation, Unknown Toxicity San Diego Creek (Reach 1) – Fecal Coliform, Selenium, Toxaphene, Nutrients, Pesticides, Sedimentation/Siltation Newport Bay (Upper) – Chlordane, Copper, DDT, Indicator Bacteria, Metals, Nutrients, PCBs, Pesticides, Sediment Toxicity, Sedimentation Siltation Newport Bay (Lower) – Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs, Pesticides, Sediment Toxicity *San Diego RWQCB:* Aliso Creek – Pathogens (Indicator Bacteria), Nutrients (Phosphorus, Total Nitrogen), Metals (Selenium), Toxicity Aliso Creek (Mouth) – Pathogens (Indicator Bacteria) Pacific Ocean at Aliso Creek (Mouth) – Pathogens (Enterococcus, Total Coliform, Fecal Coliform)
Applicable TMDLs	San Diego Creek (Reach 2) – Nutrients, Sedimentation/Siltation, Unknown Toxicity, Metals San Diego Creek (Reach 1) – Indicator Bacteria, Nutrients, Pesticides, Sedimentation/Siltation, Metals Newport Bay (Upper) – Indicator Bacteria, Nutrients, Pesticides, Sedimentation/Siltation, Metals, Siltation Newport Bay (Lower) – Indicator Bacteria, Nutrients, Pesticides, Metals, Siltation
Pollutants of Concern for the Project	Pollutants of Concern for the project include: Suspended Solids/Sediment, Nutrients, Pathogens, Pesticides, Oil & Grease, Trash & Debris. Primary Pollutants of Concern for the project include: Nutrients, Pesticides and Pathogens.
Environmentally Sensitive and Special Biological Significant Areas	Serrano Creek, San Diego Creek, Newport Bay, Aliso Creek, Aliso Creek Mouth and the Pacific Ocean at Aliso Creek Mouth are all listed as impaired water bodies and are therefore, designated as ESA's per the OC DAMP. There are no Areas of Special Biological Significance (ASBS) or ESA's within the project site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Project Performance Criteria				
(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?		YES ☐	NO ☒	N/A ☐
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	The WIHMP for San Diego Creek Watershed has been submitted to the RWQCB and is awaiting approval. Project drainage located within SOC Permit Area shall be subject to the requirements of the SOCHMP			
If HCOC exists, list applicable hydromodification control performance criteria	NOC: Post-project runoff discharge volume for the 2-year frequency storm does not exceed that of the predevelopment condition by more than 5% and time of concentration of post-development runoff for the 2-year storm event is not less than that for the predevelopment condition by more than 5%. SOC: Post-project runoff discharge rates and durations for projects shall not exceed pre-development, naturally occurring, runoff flow rates and durations by more than 10% of the time, from 10% of the 2-year runoff event up to the 10-year runoff event.			
List applicable LID performance criteria	LID BMPs for the project proposes to meet the following LID performance criteria: • Biotreat the remaining DCV onsite to the MEP.			
List applicable treatment control BMP performance criteria	Project proposes the use of LID BMPs to address the project's design capture volume.			

Calculate LID design storm capture volume for Project.	DCV = C x D x A x 43560 sf/ac x 1/12 ft/in Where: DCV = design storm capture volume, cu-ft C = runoff coefficient = (0.75 x imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) D = storm depth (inches) A = tributary area (acres) *Imp = 0.60 (Western); 0.60 (Central); 0.75 (Eastern)* *D = 0.95 inches* *A = 2.91 (Western); 14.75 (Central); 11.15 (Eastern)* *DCV (western) = 0.60 x 0.95 x 2.91 ac x 43560 sf/ac x 1/12 ft/in = 6,021.1 ft^3* *DCV (Central) = 0.60 x 0.95 x 14.75 ac x 43560 sf/ac x 1/12 ft/in = 30,519.3 ft^3* *DCV (Eastern) = 0.7125 x 0.95 x 11.15 ac x 43560 sf/ac x 1/12 ft/in = 27,396.2 ft^3* **DCV Total[1] = 64,116.6 ft^3**

[1]DCV total shown based on DMA limits and not property boundary.

IV.2. SITE DESIGN AND DRAINAGE PLAN

The primary goal of site design principles and techniques is to reduce land development impacts on water quality and downstream hydrologic conditions. Benefits of site design include reductions in the size of downstream BMPs, conveyance systems, pollutant loading and hydromodification impacts.

IV.2.1 Site Design BMPs

The following section describes the site design BMPs that have been incorporated into this project.

Minimize Impervious Area

Landscaping will be provided throughout the site, along project streets, within private lots as well as common lettered lots and recreation lot.

Maximize Natural Infiltration Capacity

Project consists of Type D soils, which is not favorable for infiltration. However, the project will utilize some retention of runoff in the project's landscaping areas to allow for some infiltration and evapotranspiration processes. These areas include parkway landscaping areas that will be designed as depressed areas (lower than adjacent paved areas), which will retain small amounts of runoff.

Preserve Existing Drainage Patterns and Time of Concentration

In general, the proposed drainage pattern is consistent with existing drainage patterns as all runoff is collected and discharged to the basin located in the northeastern portion of the project site. The time of concentration for the natural/pre-project conditions will be preserved per the project's Hydromodification Management Plan.

Disconnect Impervious Areas

Landscaping will be provided adjacent to sidewalks, within common lot areas, as well as open areas between unit complexes (MDR site) to break up the project's impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

The site has minimal estblasiehd vegetation in the pre-project condition. There are no natural areas or critical landscaping areas to preserve. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Per the 4th Term MS4 Storm Water Permits for the San Diego and Santa Ana Regions (Order No. R9-2009-0002 and Order No. R8-2009-030), Low Impact Development (LID) BMPs must be incorporated into design features and source controls to reduce project related storm water pollutants. The incorporation of LID BMPs into project design requires evaluation of LID measures

in the following treatment hierarchy: infiltration, evapotranspiration, harvest/reuse and biotreatment.

The project proposes the use of Hydrologic Source Controls and Biotreatment LID BMPs to address pollutants from the project's runoff.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be an integration of site design practices and LID BMPs. The goal of HSCs is to reduce runoff volume for a given drainage area without reducing the site's true impervious area.

Name	Included?
Localized on-lot infiltration	☒
Impervious area dispersion (e.g. roof top disconnection)	☒
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐

The following HSCs have been selected for use on this project:

HSC-1 Localized On-Lot Infiltration

A portion of the runoff from the common parkway area sidewalks will be conveyed to the adjacent parkway landscaping area for retention. The landscaping area will be depressed (approximately 2" lower than surrounding areas) and allow storage of a portion of the project's DCV for evapotranspiration and some infiltration. The locations of the parkway landscaping areas have yet to be determined in the tentative map phase of the project. The WQMP Site Plan provided in Section VI provides the approximate locations of these areas. Once the locations have been determined, the portion of the DCV captured by the depressed areas can be calculated. Until such time, the proposed bioretention BMPs shall be designed to capture and treat the full DCV for its tributary drainage areas.

HSC-1 SUMMARY						
HSC ID	**% Impervious**	**Storm Depth (D)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV (ft^3)**	**Footprint (ft^2)**
HSC XX	TBD	0.95	TBD	TBD	TBD	TBD

HSC-2 Impervious Area Dispersion

Where feasible, runoff from roofs and paved surfaces will be directed towards landscape areas to allow for filtration, evapotranspiration and some infiltration of runoff and volume reduction. Since the majority of these areas will be dependent on lot-specific improvements, they will be addressed further once the architectural design of the proposed housing units are available. Once the locations have been determined, the portion of the DCV captured by landscaped areas can be calculated. Until such time, the proposed bioretention BMPs shall be designed to capture and treat the full DCV for its tributary drainage areas.

HSC-2 SUMMARY						
HSC ID	**% Impervious**	**Storm Depth (D)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV (ft^3)**	**Footprint (ft^2)**
HSC XX	TBD	0.95	TBD	TBD	TBD	TBD

HSC-3 Street Trees

Trees will be planted along the project's parkways and within common lot areas to intercept rainfall and provide some volume reduction benefits for the project.

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐

Due to the project's unfavorable soil type (Hydrologic Soil Group D), BMPs that employ infiltration as the primary mechanism for pollutant removal have not been proposed.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
EVAPOTRANSPIRATION	
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☒
HARVEST & REUSE/ RAINWATER HARVESTING	
Above-ground cisterns and basins	☐
Underground detention	☐

Evapotranspiration

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, through some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in the proposed BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

Harvest and Reuse

Harvest and Reuse (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

The project does not propose the use of harvesting BMPs, as there is insufficient demand and oversight for captured water use in private residential homes. Additionally, the project would have reclaimed water sources available for irrigation use (TGD X.2.8).

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a class of structural LID BMPs that treat suspended solids and dissolved pollutants in storm water using mechanisms characteristic of biologically active systems. These BMPs are considered treat and release facilities and include treatment mechanisms that employ soil microbes and plants. Additional benefits of these BMPs may include aesthetic enjoyment, recreational use, wildlife habitat and reduction in storm water volume.

Due to the project site's unfavorable soil condition for implementing infiltration based BMPs, biotreatment BMPs have been selected to address project-specific pollutants of concern present in runoff prior to discharging offsite.

BIOTREATMENT		
ID	Name	Included?
BIO-1	Bioretention with underdrains	☒
	Stormwater planter boxes with underdrains	☐
	Rain gardens with underdrains	☐
BIO-5	Constructed wetlands	☐
BIO-2	Vegetated swales	☐
BIO-3	Vegetated filter strips	☐
BIO-7	Proprietary vegetated biotreatment systems	☒
BIO-4	Wet extended detention basin	☐
BIO-6	Dry extended detention basins	☐

In general, runoff from the project site will be conveyed via the project's storm drain system northeasterly to a proposed bioretention (biofiltration) basin located in the northeastern portion of the project site. In addition to addressing runoff pollutants, the basin has also been designed to meet the project's hydromodification and hydrology requirements.

BMP Sizing – Volume Based BMP

BIORETENTION (BIOFILTRATION) BASIN BMP SUMMARY						
Drainage Management Area	**% Impervious**	**Design Storm Capture Depth (in)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV Simple (ft^3)**	**DCV Constant Drawdown (ft^3)**
DMA 1A[1]	60	0.95	14.75	0.60	30,519.3	13,733.7
DMA 1B	75	0.95	11.15	0.7125	27,396.2	12,382.3

[1] DCV to be revised once volume reduced from upstream HSC can be determined.

BMP Sizing – Flow Based BMP

BIORETENTION (BIOFILTRATION) BASIN BMP SUMMARY						
Drainage Management Area	**% Impervious**	**Design Storm Capture Depth (in)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV Simple (ft^3)**	**Q_{BMP} (cfs)**
DMA 2[1]	60	0.95	2.91	0.60	6,021.1	0.472

[1] DCV to be revised once volume reduced from upstream HSC can be determined.

IV.3.5 Hydromodification Control BMPs

The eastern portion of the project site is subject to the hydromodification requirements of the SOCHMP. The proposed basin will be employed to address the project's DCV and mitigate for hydromodification/hydrological impacts.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. Treatment of projects DCV will be addressed onsite.

IV.3.7 Treatment Control BMPs

Not applicable. Project proposes the use of LID BMPs to address potential pollutants present in the project's runoff.

IV.3.8 Non-structural Source Control BMPs

The Table below indicates all Non-Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed facility will not generate waste subject to Title 22 CCR compliance.
N6	Local Industrial Permit Compliance	☐	☒	Not applicable to residential developments or parks.
N7	Spill Contingency Plan	☐	☒	Proposed facilities will not generate waste or store materials subject to the requirements of Chapter 6.95 of the CA Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	None proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Proposed project will not store or generate hazardous materials subject to agency requirements.
N10	Uniform Fire Code Implementation	☐	☒	Proposed facility does not propose to store toxic or highly toxic compressed gases.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☐	☒	Proposed project is residential.
N13	Housekeeping of Loading Docks	☐	☒	No loading docks proposed.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Project is for residential community development only.

IV.3.9 Structural Source Control BMPs

The Table below indicates all Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas proposed for project use.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	No designated common trash area proposed.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	None proposed.
S7	Maintenance bays	☐	☒	None proposed.
S8	Vehicle wash areas	☐	☒	None proposed.
S9	Outdoor processing areas	☐	☒	None proposed.
S10	Equipment wash areas	☐	☒	None proposed.
S11	Fueling areas	☐	☒	None proposed.
S12	Hillside landscaping	☐	☒	None proposed
S13	Wash water control for food preparation areas	☐	☒	None proposed.
S14	Community car wash racks	☐	☒	None proposed.

A discussion of each selected source control BMP is provided in Section V of this WQMP.

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

IV.4.1 Water Quality Credits

The proposed project is able to meet LID compliance via the employment of onsite LID practices. Therefore, water quality credits do not apply to this project.

<table>
<tr><th colspan="6">Description of Proposed Project</th></tr>
<tr><td colspan="6">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐ Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐ Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td colspan="2">☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="2">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐ Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
<tr><td>Calculation of Water Quality Credits
(if applicable)</td><td colspan="5">Not Applicable.</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

Not applicable. The project is able to meet LID BMP requirements onsite to address pollutants in project related storm water runoff.

Section V Inspection/Maintenance Responsibility for BMPs

Refer to the BMP inspection and maintenance responsibility matrix below. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		**Inspection/ Maintenance Activities Required**	**Minimum Frequency**	**Reponsible Party(s)**
HYDROLOGIC SOURCE CONTROL BMPs				
HSC-1	On-Lot Infiltration	Inspect for standing water and that water evaporates, transpires or infiltrates into underlying soil completely. Remove accumulated sediment as needed.	After significant storm events, with weekly landscape maintenance and annually	Owner/HOA
HSC-2	Impervious Area Dispersion	Inspect for standing water and that water evaporates, transpires or infiltrates into underlying soil completely. Remove accumulated sediment as needed.	After significant storm events, with weekly landscape maintenance and annually	Owner/HOA
BIO-TREATMENT BMPs				
BIO-1	Bioretention with Underdrains (Biofiltration Basin)	Inspect with landscaping maintenance activities for weed growth, mulch depth, standing water, visible signs of erosion and vegetation health. Repair/replace as needed.	Weekly with landscaping maintenance activities	Owner/HOA
BIO-7	Proprietary Biotreatment (Katchall, Filterra, MWS or approved equivalent)	Inspect prior to the rainy season and after significant storm events. Clean out and/or replace mulch/media per manufacturer's recommendations	Annual and after significant storm events	Owner/HOA
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Educational materials will be provided to homeowners at close of escrow by the developer and thereafter on an annual basis by the HOA. Materials shall include those provided in Attachment A of this WQMP and any updated materials.	Annually	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		**Inspection/ Maintenance Activities Required**	**Minimum Frequency**	**Reponsible Party(s)**
N2	Activity Restrictions	The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the Homeowners Association (HOA), the HOA shall be responsible for ensuring residents compliance.	Ongoing	Owner/HOA
N3	Common Area Landscape Management	Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usages shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Weekly	Owner/HOA
N4	BMP Maintenance	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing	Owner/HOA
N11	Common Area Litter control	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Littler collection and removal shall be performed on a weekly basis.	Weekly	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		**Inspection/ Maintenance Activities Required**	**Minimum Frequency**	**Reponsible Party(s)**
N14	Common Area Catch Basin Inspection	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events.	Annually	Owner/HOA
N15	Street Sweeping Private Streets	Streets shall be swept at minimum prior to the storm season, in late summer or early fall.	Annually	Owner/HOA
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stencilling and signage	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Owner/HOA
S4 SD-10; SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Monthly	Owner/HOA
S5	Protect slopes and channels and provide energy dissipation	Inspect slopes for signs of erosion and repair as soon as possible. Inspect for vegetation health and cover and replace/replant as needed. Inspect rip rap (in basin) for signs of erosion. Repair as needed.	Monthly	Owner/HOA

Section VI Site Plan and Drainage Plan

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

Exhibits

- Vicinity Map
- Conceptual WQMP Site Plan

BMP Details

- HSC-1 On-Lot Infiltration
- HSC-2 Impervious Area Dispersion
- BIO-1 Bioretention with Underdrains
- BIO-7 Proprietary Biotreatment

Vicinity Map, Conceptual WQMP Site Plan, BMP Calculations & Details

SCALE: 1" = 2000'

TTM 17707

Foothill Ranch

DRAWN BY:	TIH
DATE:	2/26/14
REVISED:	
W.O. #:	2118-8

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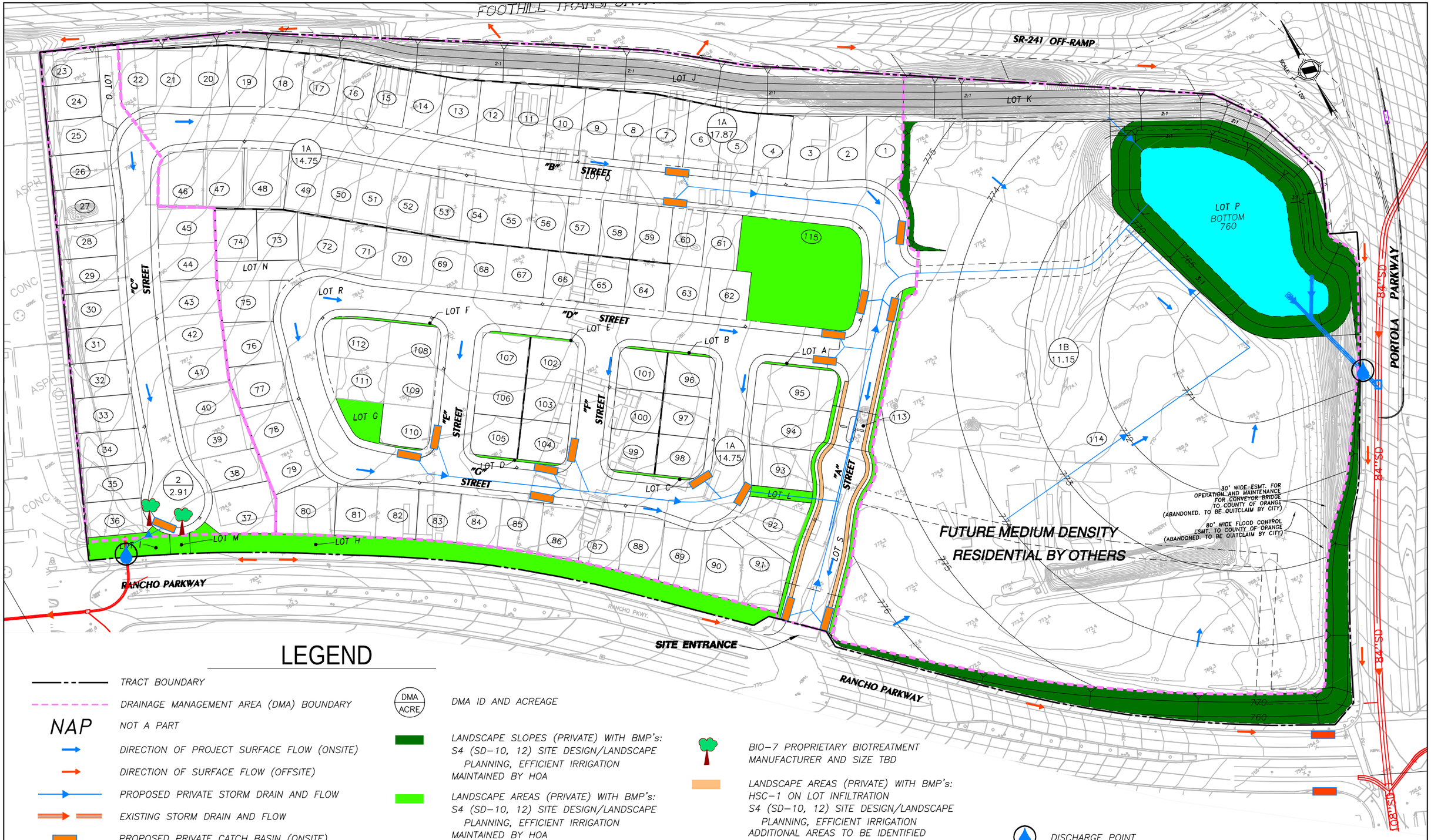
TENTATIVE TRACT MAP NO. 17707
28201 RANCHO PARKWAY
CITY OF LAKE FOREST
COUNTY OF ORANGE, CA

CONCEPTUAL WQMP VICINITY MAP

PLOTTED BY: Tommy Hsu DATE: Feb. 26, 2014 12:52:22 PM FILE: L:\El Toro Materials\SY_WQ\WQMP\Exhibits\WQMP VIC_17707.dwg



LEGEND

- TRACT BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- NAP — NOT A PART
- DIRECTION OF PROJECT SURFACE FLOW (ONSITE)
- DIRECTION OF SURFACE FLOW (OFFSITE)
- PROPOSED PRIVATE STORM DRAIN AND FLOW
- EXISTING STORM DRAIN AND FLOW
- PROPOSED PRIVATE CATCH BASIN (ONSITE)
- EXISTING CATCH BASIN (OFFSITE)
- DETENTION BASIN (HYDROMOD)
  BIO–1 BIORETENTION WITH UNDERDRAIN
  MAINTAINED BY HOA
- DMA / ACRE — DMA ID AND ACREAGE
- LANDSCAPE SLOPES (PRIVATE) WITH BMP's:
  S4 (SD–10, 12) SITE DESIGN/LANDSCAPE PLANNING, EFFICIENT IRRIGATION
  MAINTAINED BY HOA
- LANDSCAPE AREAS (PRIVATE) WITH BMP's:
  S4 (SD–10, 12) SITE DESIGN/LANDSCAPE PLANNING, EFFICIENT IRRIGATION
  MAINTAINED BY HOA
- BIO–7 PROPRIETARY BIOTREATMENT
  MANUFACTURER AND SIZE TBD
- LANDSCAPE AREAS (PRIVATE) WITH BMP's:
  HSC–1 ON LOT INFILTRATION
  S4 (SD–10, 12) SITE DESIGN/LANDSCAPE PLANNING, EFFICIENT IRRIGATION
  ADDITIONAL AREAS TO BE IDENTIFIED
  MAINTAINED BY HOA
- DISCHARGE POINT

DRAWN BY:	TIH
DATE:	2/26/14
REVISED:	
W.O. #:	2118-8

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TENTATIVE TRACT MAP NO. 17707
28201 RANCHO PARKWAY
CITY OF LAKE FOREST
COUNTY OF ORANGE, CA

CONCEPTUAL WQMP SITE PLAN

PLOTTED BY: Tommy Hsu DATE: Feb. 26, 2014 01:03:51 PM FILE: L:\El Toro Materials\SY_WQ\WQMP\Exhibits\WQMP SP_17707 no bio.dwg

BMP Calculations and Details – On-Lot Infiltration (HSC-1) and Impervious Area Dispersion (HSC-2)

Worksheet A: Hydrologic Source Control Calculation Form

Drainage area ID	DMA 1A			
Total drainage area	17.204	acres		
Total drainage area Impervious Area (IA_{total})	10.207	acres		
HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets **(**XIV.1**)** (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
XX	Depressed Parkway Landscaping Areas	TBD	TBD	TBD
	Box 1:	$\sum d_i \times IA_i =$		
	Box 2:	$IA_{total} =$		
	[Box 1]/[Box 2]:	$d_{HSC\ total} =$		
		*Percent Capture Provided by HSCs (*Table III.1*)*		

XIV.1. Hydrologic Source Control Fact Sheets (HSC)

HSC-1: Localized On-Lot Infiltration

'Localized on-lot infiltration' refers to the practice of collecting on-site runoff from small distributed areas within a catchment and diverting it to a dedicated on-site infiltration area. This technique can include disconnecting downspouts and draining sidewalks and patios into french drains, trenches, small rain gardens, or other surface depressions. For downspout disconnections and other impervious area disconnection involving dispersion over pervious surfaces, but without intentional ponding, see HSC-2: Impervious Area Dispersion.

Also known as:

- *Downspout infiltration*
- *Retention grading*
- *French drains*
- *On-lot rain gardens*

On-lot rain garden
Source: lowimpactdevelopment.org

Feasibility Screening Considerations

- „Localized on-lot infiltration" shall meet infiltration infeasibility screening criteria to be considered for use.

Opportunity Criteria

- Runoff can be directed to and temporarily pond in pervious area depressions, rock trenches, or similar.
- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Shallow utilities are not present below infiltration areas.

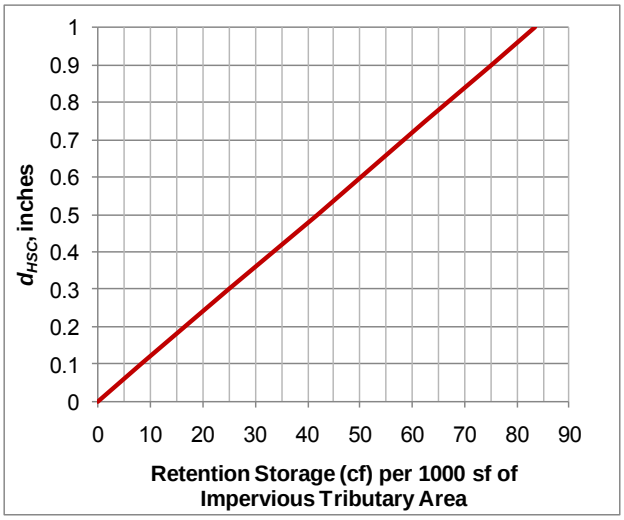
OC-Specific Design Criteria and Considerations

- ☐ A single on-lot infiltration area should not be sized to retain runoff from impervious areas greater than 4,000 sq. ft.; if the drainage area exceeds this criteria, sizing should be based on calculations for bioretention areas or infiltration trenches.
- ☐ Soils should be sufficiently permeable to eliminate ponded water within 24 hours following a 85th percentile, 24-hour storm event.
- ☐ Maximum ponding depth should be should be less than 3 inches and trench depth should be less than 1.5 feet.
- ☐ Infiltration should not be used when the depth to the mounded seasonally high table is within 5 feet of the bottom of infiltrating surface.
- ☐ Infiltration via depression storage, french drains, or rain gardens should be located greater than 8 feet from building foundations.
- ☐ Site slope should be less than 10%.
- ☐ Infiltration unit should not be located within 50 feet of slopes greater than 15 percent.
- ☐ Side slopes of rain garden or depression storage should not exceed 3H:1V.
- ☐ Effective energy dissipation and uniform flow spreading methods should be employed to prevent erosion resulting fromwater entering infiltration areas.

☐ Overflow should be located such that it does not cause erosion orand is conveyed away from structures toward the downstream conveyance and treatment system. .

Calculating HSC Retention Volume

- The retention volume provided by localized on-lot infiltration can be computed as the storage volume provided by surface ponding and the pore space within an amended soil layer or gravel trench.
- Estimate the average retention volume per 1000 square feet impervious tributary area provided by on-lot infiltration.
- Look up the storm retention depth, d_{HSC} from the chart to the right.
- The max d_{HSC} is equal to the design capture storm depth for the project site.



Configuration for Use in a Treatment Train

- Localized on-lot infiltration would typically serve as the first in a treatment train and should only be used where tributary areas do not generate significant sediment that would require pretreatment to mitigate clogging.
- The use of impervious area disconnection reduces the sizing requirement for downstream LID and/or conventional treatment control BMPs.

Additional References for Design Guidance

- LID Center – Rain Garden Design Template. http://www.lowimpactdevelopment.org/raingarden_design/
- University of Wisconsin Extension. Rain Gardens: A How-To Manual for Homeowners. http://learningstore.uwex.edu/assets/pdfs/GWQ037.pdf

HSC-2: Impervious Area Dispersion

Also known as:

- *Downspout disconnection*
- *Impervious area disconnection*
- *Sheet flow dispersion*

Impervious area dispersion refers to the practice of routing runoff from impervious areas, such as rooftops, walkways, and patios onto the surface of adjacent pervious areas. Runoff is dispersed uniformly via splash block or dispersion trench and soaks into the ground as it move slowly across the surface of pervious areas. Minor ponding may occur, but it is not the intent of this practice to actively promote localized on-lot storage (See HSC-1: Localized On-Lot Infiltration).

Simple Downspout Dispersion
Source: toronto.ca/environment/water.htm

Feasibility Screening Considerations

- Impervious area dispersion can be used where infiltration would otherwise be infeasible, however dispersion depth over landscaped areas should be limited by site-specific conditions to prevent standing water or geotechnical issues.

Opportunity Criteria

- Rooftops and other low traffic impervious surface present in drainage area.
- Soils are adequate for infiltration. If not, soils can be amended to improve capacity to absorb dispersed water (see MISC-2: Amended Soils).
- Significant pervious area present in drainage area with shallow slope
- Overflow from pervious area can be safely managed.

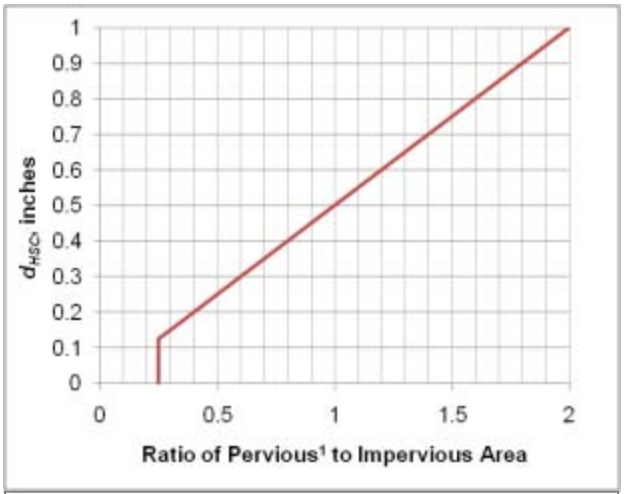
OC-Specific Design Criteria and Considerations

- ☐ Soils should be preserved from their natural condition or restored via soil amendments to meet minimum criteria described in Section .
- ☐ A minimum of 1 part pervious area capable of receiving flow should be provided for every 2 parts of impervious area disconnected.
- ☐ The pervious area receiving flow should have a slope ≤ 2 percent and path lengths of ≥ 20 feet per 1000 sf of impervious area.
- ☐ Dispersion areas should be maintained to remove trash and debris, loose vegetation, and protect any areas of bare soil from erosion.
- ☐ Velocity of dispersed flow should not be greater than 0.5 ft per second to avoid scour.

Calculating HSC Retention Volume

- The retention volume provided by downspout dispersion is a function of the ratio of impervious to pervious area and the condition of soils in the pervious area.
- Determine flow patterns in pervious area and estimate footprint of pervious area receiving dispersed flow. Calculate the ratio of pervious to impervious area.
- Check soil conditions using the soil condition design criteria below; amend if necessary.
- Look up the storm retention depth, d_{HSC} from the chart below.

- The max d_{HSC} is equal to the design storm depth for the project site.



[1] Pervious area used in calculation should only include the pervious area receiving flow, not pervious area receiving only direct rainfall or upslope pervious drainage.

Soil Condition Design Criteria

☐ Maximum slope of 2 percent

☐ Well-established lawn or landscaping

☐ Minimum soil amendments per criteria in MISC-2: Amended Soils.

Configuration for Use in a Treatment Train

- Impervious area disconnection is an HSC that may be used as the first element in any treatment train
- The use of impervious area disconnection reduces the sizing requirement for downstream LID and/or treatment control BMPs

Additional References for Design Guidance

- SMC LID Manual (pp 131) http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- City of Portland Bureau of Environmental Services. 2010. How to manage stormwater – Disconnect Downspouts. http://www.portlandonline.com/bes/index.cfm?c=43081&a=177702
- Seattle Public Utility: http://www.cityofseattle.org/util/stellent/groups/public/@spu/@usm/documents/webcontent/spu01_006395.pdf
- Thurston County, Washington State (pp 10): http://www.co.thurston.wa.us/stormwater/manual/docs-faqs/DG-5-Roof-Runoff-Control_Rev11Jan24.pdf

BMP Calculations and Details – Bioretention with Underdrains

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1A (Central)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.95	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours) $T = (d_p/K_{design})$ x 12 in/ft (K_{design} assume 2.5"/hr)	T=	7.2	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.45	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=	0	
7	Calculate the fraction of design volume that must be provided by BMP, $fraction = X_1 - X_2$	fraction=	0.45	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction} = fraction \times d$ = (0.45)(0.95") = 0.4275	$d_{fraction}$=	0.4275	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	14.75	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.60	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.60	
4	Calculate runoff volume, $V_{design} = (C \times d_{fraction} \times A \times 43560 \times (1/12))$	V_{design}=	13,733.7	cu-ft

Supporting Calculations

Describe system: System consists of basin with 2' depth of engineered media, 1.5' ponding depth and perforated pipes beneath engineered media.

Step 1.8 - $d_{fraction} = fraction \times d$ = (0.25)(0.95") = 0.4275

Step 2.3 – $C= (0.75 \times imp) + 0.15 = (0.75 \times 0.60) + 0.15 = 0.6$

Step 2.4 – $V_{design} = (0.60 \times 0.4275 \times 14.75 \times 43560 \times 1/12) = 13,733.7$ ft^3

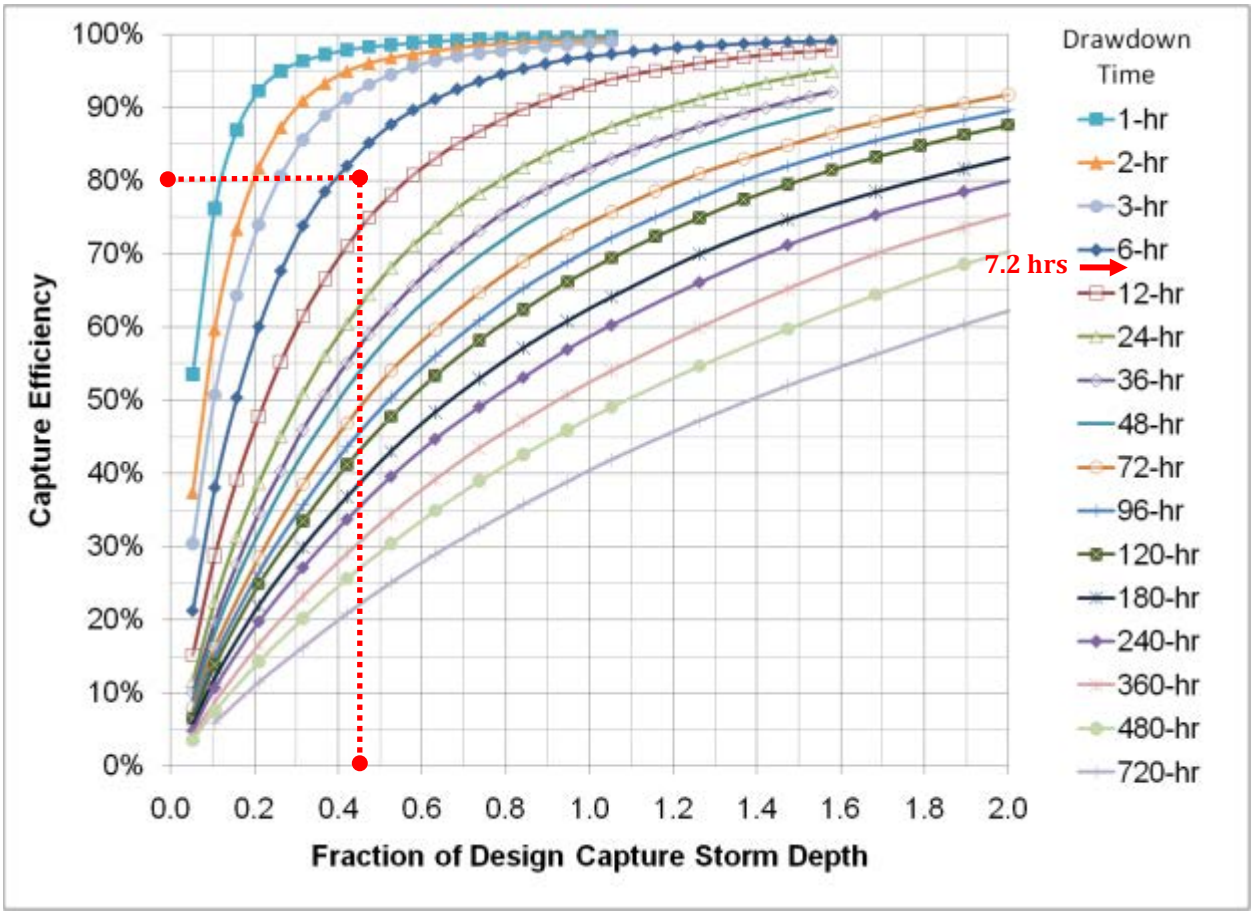
Per Bio-1 of TGD, area needed for BMP = V_{design}/d_p = 13,733.7 ft^3 / 1.5 ft = 9,155.8 ft^2

Simple method DCV = (0.60 x 0.95" x 14.75 x 43560 x 1/12) = 30,519.3 ft^3

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1A (Central)

Provide drawdown time calculations per applicable BMP Fact Sheet:
Step 1.2 – Drawdown Time (T) = (d_p/K_{design}) x 12 in/ft (K_{design} assume 2.5"/hr) = (1.5/2.5) x 12 = 7.2 hrs

Graphical Operations



Provide supporting graphical operations. See Example III.6.

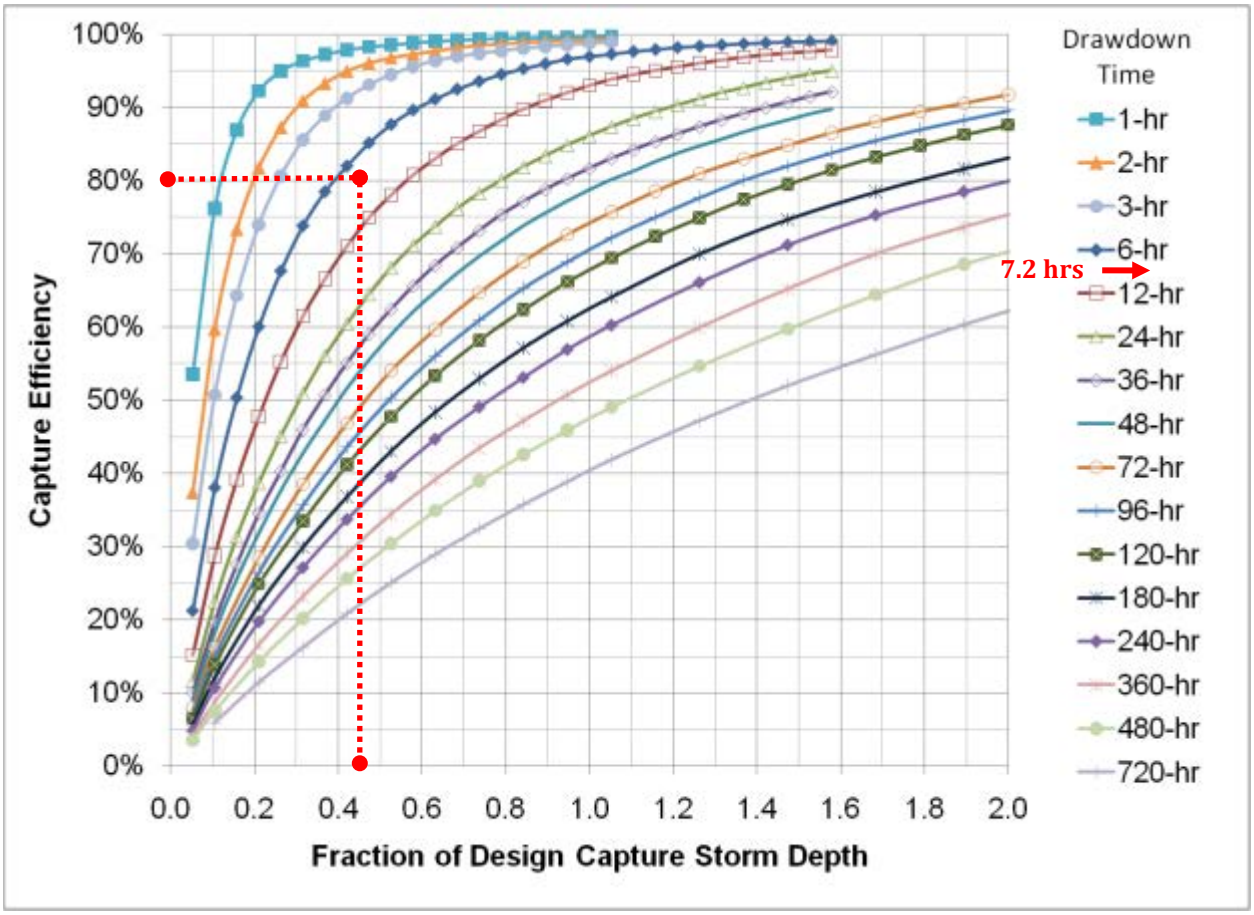
Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1B (East)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.95	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours) $T = (d_p/K_{design})$ x 12 in/ft (K_{design} assume 2.5"/hr)	T=	7.2	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.45	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=	0	
7	Calculate the fraction of design volume that must be provided by BMP, $fraction = X_1 - X_2$	fraction=	0.45	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction} = fraction \times d$ = (0.45)(0.95") = 0.4275	$d_{fraction}$=	0.4275	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	11.15	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.75	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.7125	
4	Calculate runoff volume, $V_{design} = (C \times d_{fraction} \times A \times 43560 \times (1/12))$	V_{design}=	12,174.6	cu-ft
Supporting Calculations				
Describe system: System consists of basin with 2' depth of engineered media, 1.5' ponding depth and perforated pipes beneath engineered media. Step 1.8 - $d_{fraction} = fraction \times d$ = (0.25)(0.95") = 0.4275 Step 2.3 – $C= (0.75 \times imp) + 0.15 = (0.75 \times 0.2) + 0.15 = 0.7125$ Step 2.4 – $V_{design} = (0.7125 \times 0.4275 \times 11.15 \times 43560 \times 1/12) = 12,382.3$ ft^3 Per Bio-1 of TGD, area needed for BMP = V_{design}/d_p = 12,382.3 ft^3 / 1.5 ft = 8,218.9 ft^2 Simple method DCV = (0.7125 x 0.95" x 11.011 x 43560 x 1/12) = 27,396.2 ft^3				

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1B (East)

Provide drawdown time calculations per applicable BMP Fact Sheet:
Step 1.2 – Drawdown Time (T) = (d_p/K_{design}) x 12 in/ft (K_{design} assume 2.5"/hr) = (1.5/2.5) x 12 = 7.2 hrs

Graphical Operations



Provide supporting graphical operations. See Example III.6.

XIV.5. Biotreatment BMP Fact Sheets (BIO)

Conceptual criteria for biotreatment BMP selection, design, and maintenance are contained in **Appendix XII**. These criteria are generally applicable to the design of biotreatment BMPs in Orange County and BMP-specific guidance is provided in the following fact sheets.

*Note: Biotreatment BMPs shall be designed to provide the maximum feasible infiltration and ET based on criteria contained in **Appendix XI.2**.*

BIO-1: Bioretention with Underdrains

Also known as:

- *Rain gardens with underdrains*
- *Vegetated media filter*
- *Downspout planter boxes*

Bioretention
Source: Geosyntec Consultants

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants. Bioretention with an underdrain are utilized for areas with low permeability native soils or steep slopes where the underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration. **Bioretention must be designed without an underdrain** in areas of high soil permeability.

Feasibility Screening Considerations

- If there are no hazards associated with infiltration (such as groundwater concerns, contaminant plumes or geotechnical concerns), **bioinfiltration facilities**, which achieve partial infiltration, should be used to maximize infiltration.
- Bioretention with underdrain facilities should be lined if contaminant plumes or geotechnical concerns exist. If high groundwater is the reason for infiltration infeasibility, bioretention facilities with underdrains do not need to be lined.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, road medians, and next to buildings in planter boxes.
- Drainage area is ≤ 5 acres.
- Area is available for infiltration.

- Site must have adequate relief between land surface and the stormwater conveyance system to permit vertical percolation through the soil media and collection and conveyance in underdrain to stormwater conveyance system.

OC-Specific Design Criteria and Considerations

- ☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth is greater than 6 inches to mitigate drowning.
- ☐ The minimum soil depth is 2 feet (3 feet is preferred).
- ☐ The maximum drawdown time of the bioretention ponding area is 48 hours. The maximum drawdown time of the planting media and gravel drainage layer is 96 hours, if applicable.
- ☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.
- ☐ If infiltration in bioretention location is hazardous due to groundwater or geotechnical concerns, a geomembrane liner must be installed at the base of the bioretention facility. This liner should have a minimum thickness of 30 mils.
- ☐ The planting media placed in the cell shall be designed per the recommendations contained in MISC-1: Planting/Storage Media
- ☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native place species and/or hardy cultivars that are not invasive and do not require chemical inputs should be used to the maximum extent feasible
- ☐ The bioretention area should be covered with 2-4 inches (average 3 inches) or mulch at the start and an additional placement of 1-2 inches of mulch should be added annually.
- ☐ Underdrain should be sized with a 6 inch minimum diameter and have a 0.5% minimum slope. Underdrain should be slotted polyvinyl chloride (PVC) pipe; underdrain pipe should be more than 5 feet from tree locations (if space allows).
- ☐ A gravel blanket or bedding is required for the underdrain pipe(s). At least 0.5 feet of washed aggregate must be placed below, to the top, and to the sides of the underdrain pipe(s).
- ☐ An overflow device is required at the top of the bioretention area ponding depth.
- ☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.
- ☐ Ponding area side slopes shall be no steeper than 3:1 (H:V) unless designed as a planter box BMP with appropriate consideration for trip and fall hazards.

Simple Sizing Method for Bioretention with Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioretention with underdrain facility, the user selects the basin depth and then determines the appropriate surface area to capture the DCV. The sizing steps are as follows:

Step 1: Determine DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$DD_P = (d_P / K_{MEDIA}) \times 12$ in/ft

Where:

DD_P = time to drain ponded water, hours

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media infiltration rate until 48 hour drawdown time is achieved.

Step 3: Determine the Depth of Water Filtered During Design Capture Storm

The depth of water filtered during the design capture storm can be estimated as the amount routed through the media during the storm, or the ponding depth, whichever is smaller.

$d_{FILTERED}$ = Minimum [$((K_{MEDIA} \times T_{ROUTING})/12)$, d_P]

Where:

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

$T_{ROUTING}$ = storm duration that may be assumed for routing calculations; this should be assumed to be no greater than 3 hours. If the designer desires to account for further routing effects, the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) should be used.

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Step 4: Determine the Facility Surface Area

$A = DCV / (d_P + d_{FILTERED})$

Where:

A = required area of bioretention facility, sq-ft

DCV = design capture volume, cu-ft

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Capture Efficiency Method for Bioretention with Underdrains

If the bioretention geometry has already been defined and the user wishes to account more explicitly for routing, the user can determine the required footprint area using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$DD = (d_p / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain infiltration basin ponding depth, hours

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

K_{DESIGN} = design media infiltration rate, in/hr (assume 2.5 inches per hour unless otherwise proposed)

If drawdown is less than 3 hours, the drawdown time should be rounded to 3 hours or the Capture Efficiency Method for Flow-based BMPs (See **Appendix III.3.3**) shall be used.

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 3: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

A = Design Volume / d_p

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

Design Volume = fraction of DCV, adjusted for drawdown, cu-ft (see Step 2)

d_p = ponding depth of water stored in bioretention area, ft (from Step 1)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Bioretention areas may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required design volume of the bioretention cell. For example, bioretention could be used to manage overflow from a cistern.
- Bioretention areas can be used to provide pretreatment for underground infiltration systems.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf
- SMC LID Manual (pp 68): http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
- San Diego County LID Handbook Appendix 4 (Factsheet 7): http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf

  Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf

BMP Calculations and Details – Proprietary Biotreatment (BIO-7)

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c =	5	Min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1 =	0.27	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC} =	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2 =	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2 =	0	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design} =	0.27	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	2.91	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.60	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.60	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design} =	0.472	cfs

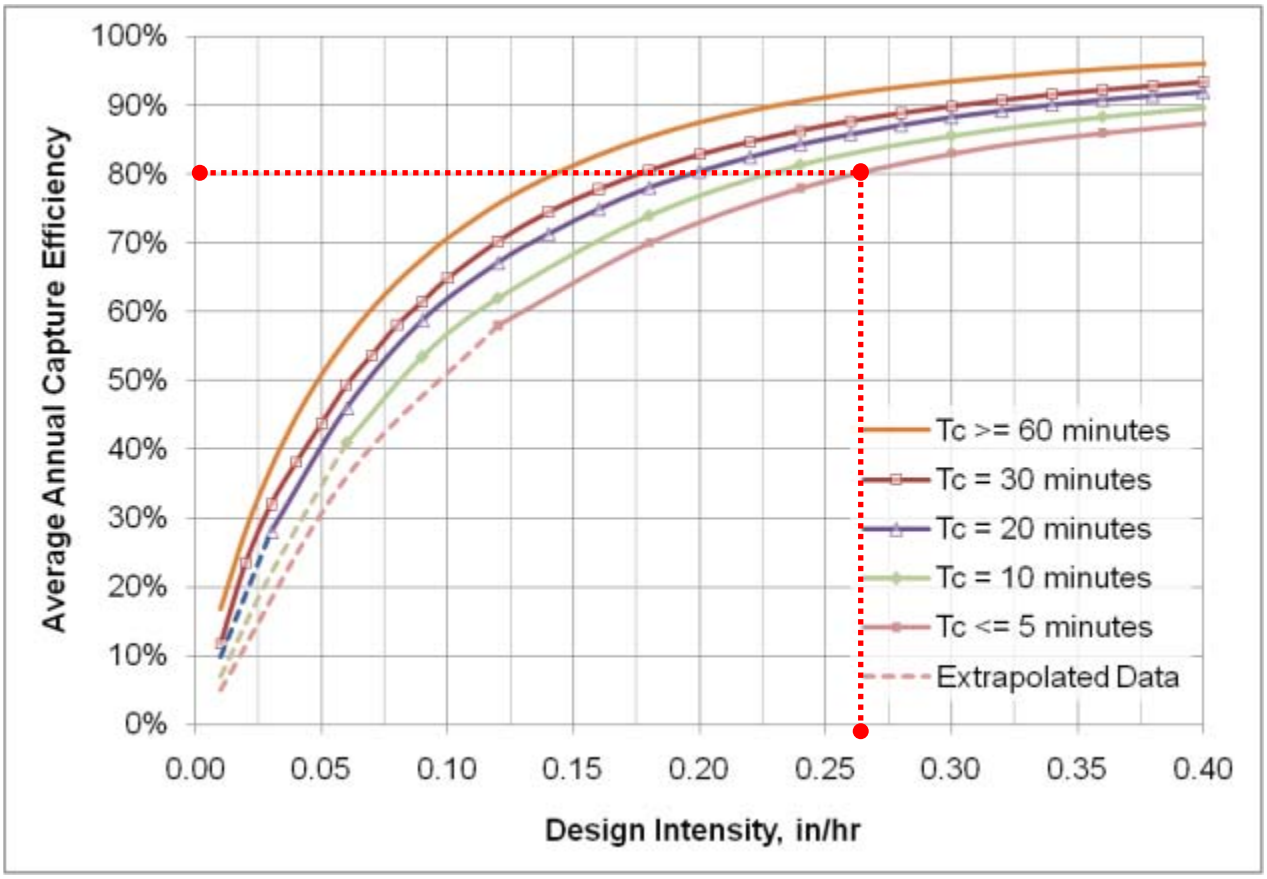
Supporting Calculations

Describe system: Runoff conveyed as gutter flow on either side of street to 1 of 2 proprietary biotreatment BMPs (eg. Katchall Purestream, Filterra, MWS, etc.) located on either side of catch basin inlet.

Provide time of concentration assumptions: Assume 5 minutes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

BIO-7: Proprietary Biotreatment

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways.

Also known as:

- *Catch basin planter box*
- *Bioretention vault*
- *Tree box filter*

Proprietary biotreatment
Source: http://www.americastusa.com /index.php/filterra/

Feasibility Screening Considerations

- Proprietary biotreatment devices that are unlined may cause incidental infiltration. Therefore, an evaluation of site conditions should be conducted to evaluate whether the BMP should include an impermeable liner to avoid infiltration into the subsurface.

Opportunity Criteria

- Drainage areas of 0.25 to 1.0 acres.
- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Proprietary biotreatment facilities may also be applied in parking lot islands, traffic circles, road shoulders, and road medians.
- Must not adversely affect the level of flood protection provided by the drainage system.

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

☐ Consult proprietors for specific criteria concerning the design and performance.

☐ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.

☐ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.

☐ In right of way areas, plant selection should not impair traffic lines of site. Local jurisdictions may also limit plant selection in keeping with landscaping themes.

Computing Sizing Criteria for Proprietary Biotreatment Device

- Proprietary biotreatment devices can be volume based or flow-based BMPs.
- Volume-based proprietary devices should be sized using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** or the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs described in **Appendix III.3.2**.
- The required design flowrate for flow-based proprietary devices should be computed using the Capture Efficiency Method for Flow-based BMPs described in **Appendix III.3.3)**.

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 9: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- Santa Barbara BMP Guidance Manual, Chapter 6: **http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf**

Section VII Educational Materials

Education Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☒		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☒		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☒		☐

Attachment A

Educational Materials

Educational Materials to be provided in Final WQMP for dispersal to HOA and Homeowners, as appropriate.

Attachment B

O & M Plan

See Section V. Signed/Notarized O&M Plan to be provided at Final WQMP.